R&D Progress in Analytical Technologies Supporting MANPRINT

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R&D Progress in Analytical Technologies Supporting MANPRINT

Outline:

1. Access to listing of tools
2. JACK developments
3. IMPRINT

Directory of Design Support Methods (DDSM)

Please read this privacy and security notice.

This Directory contains references to human systems integration (HSI) design and interface tools, techniques, databases, guides and standardization documents. HSI/LIVEWARE encompasses human factors, human performance, training, manpower and personnel systems analysis and design. Contributors include: U.S. Department of Defense (DoD), Federal Aviation Administration (FAA), National Aeronautical and Space Administration (NASA), other U.S. government agencies, NATO, academia, and private industry. The records within this Directory are available in the MATRIS database as well as in electronic and hardcopy document format.

- Preface
- Preamble to Standardization Documents
- All Records

To view records within a given category, please select:

- Analytic Techniques
- Databases
- Handbooks/Guides/Courses
- Information Service Centers
- Standardization Documents
- Tools

analytic

There are **16** items found:

1. Army Early Comparability Analysis (ECA)
2. D-CIDER
3. Continuous Safety Sampling Methodology (CSSM)
4. Test Planning, Analysis, and Evaluation System (Test PAES)
5. Timeline Management Tool (TMT)
6. HARDMAN Comparability Methodology (HCM)
7. Requirements Management Strategy (RMS)
8. Tribus Process Analysis
9. Cognitive Neurometric System (CNS)
10. Army Military-Civilian Cost System (AMCOS)
11. Parameter Assessment List - MANPRINT Automated Tool Edition (PAL-MATE)
12. Estimating Predictive Validity When Range Restriction Due to Selection and Attrition Is Present
13. 3-D System Safety Engineering Analysis
14. Complex Cognitive Assessment Battery (CCAB)
15. Digital Anthropometric Video Imaging Device (DAVID)
16. Training Delivery Assessment Model (TRADAM)

tool

There are **67** items found:

1. JA! (JavAnimator)
2. Hybridizer
3. Custom Secure Browser
4. Improved Performance Research Integration (IMPRINT) Tool
5. Auditory Hazard Assessment Algorithm (AHAAH)
6. GS-Design
7. LOCATE
8. Systems Operator Loading Evaluation (SOLE)/Integrated Performance Modeling Environment (IPME)
9. dVISE
10. Transom(tm) Jack(r) Human Simulation Software
11. Reliable Human-Machine System Developer (REHMS-D)(tm)
12. Boeing McDonnell Douglas Human Modeling System (BMD-HMS)
13. Intergraph's Engineering Modeling System (EMS) Software
14. Man-Machine Integration Design and Analysis Systems (MIDAS)
15. Micro Saint with Action View (Systems Analysis of Integrated Networks of Tasks)
16. Display Visibility Modeling
17. Operator Workload Knowledge-Based Expert System Technology (OWLKNEST)
18. Perception and Performance Prototype (P3)
19. Task Analysis Workload (TAWL)
20. Design Evaluation for Personnel, Training, and Human Factors (DEPTH)
21. Manpower, Personnel, and Training in Acquisition Decision Support System (MPTDSS)
22. Automated Neuropsychological Assessment Metrics (ANAM)
23. Air Combat Environment Test and Evaluation Facility (ACETEF)
24. Logistics Composite Model (LCOM)
25. Information Processing/Perceptual Control Theory (IP/PCT) Model
26. Subjective Workload Assessment Technique (SWAT)
27. Generator of Body Data (GEBOD)
28. Articulated Total Body (ATB) Model
29. DYNAMAN

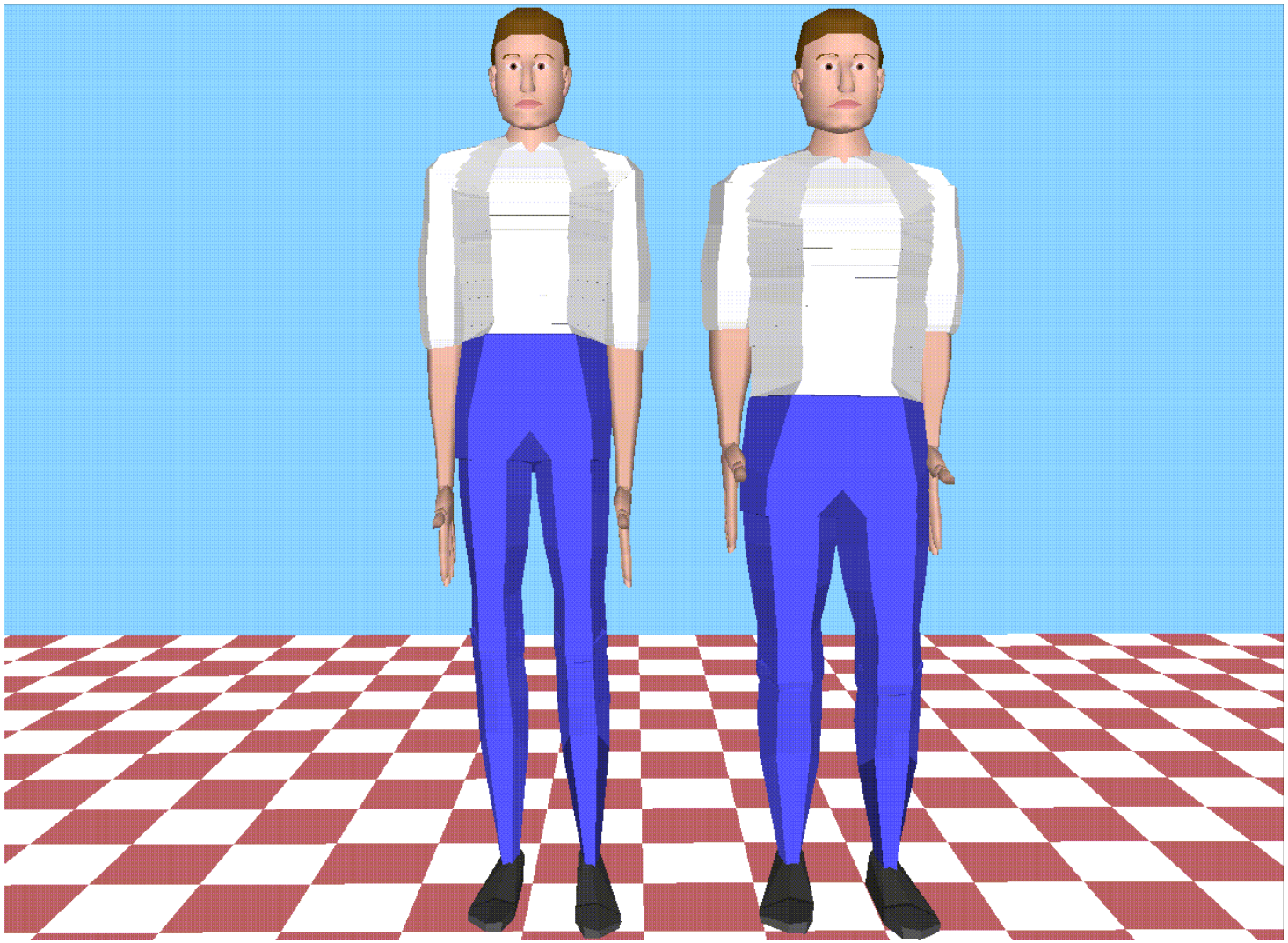
30. 2D Static Strength Prediction Program (TM)
31. ComputerMan
32. INJURY 5.0
33. USARIEM Heat Strain Model, P2NBC2 Heat Strain Decision Aid Implementation, Version 2.1
34. VISION 3000 Software
35. BATMAN & ROBIN: Friendly Interfaces for Performance Measurement
36. Critical Tracking Task (CTT) Software
37. COMBIMAN - COMputerized BIomechanical HuMAN-Model
38. SAFEWORK(tm)
39. Expert System for Test Program Set Quality Assurance (ESQA)
40. Simulation Network Analysis Project (SNAP)
41. Operational Requirements-Based Casualty Assessment System (ORCA)
42. Ship System HSI, Affordability, & Performance Engineering (SHIPSHAPE) Tools
43. SHIPSHAPE Human Systems Integration (HSI) Process Tool
44. SHIPSHAPE Hypertext Tool for ASTM-F-1166 (HT-1166)
45. HSI/MANPRINT Integrated Decision/Engineering Aid (IDEA) Tools
46. IDEA Human Systems Integration (HSI) Process Tool
47. IDEA/SHIPSHAPE Tradeoff Analysis (ITALIC)
48. IDEA/SHIPSHAPE Safety Hazard Analyzer, Developer and Evaluator (I-SHADE)
49. IDEA Hypertext Tool for MIL-STD-1472 (HT-1472)
50. Computer-Aided Systems Human Engineering (CASHE)
51. IDEA/SHIPSHAPE Role of the Person (ROPER) Function Allocation Tool
52. Carlow Usability Test Tool for Evaluation and Research (CUTTER)
53. IDEA/SHIPSHAPE Task Analysis (I-TASK)
54. IDEA/SHIPSHAPE Task Sequencing (NETWORK(c))
55. IDEA/SHIPSHAPE Simulation for Workload Assessment and Modeling (SIMWAM(c))
56. IDEA/SHIPSHAPE Human Factors Engineering Data Guide for Evaluation (I-HEDGE)
57. IDEA/SHIPSHAPE Human Systems Integration Planning (I-PLAN)
58. IDEA/SHIPSHAPE Comparability Analysis (I-CAN)

59. Training Analysis Support Computer System (TASCS)
60. CREW CHIEF - A 3-D Computer-Graphics Model of a Maintenance Technician
61. WinCrew
62. Integrated Performance Modeling Environment (IPME)
63. Applied Cognitive Task Analysis (ACTA)
64. Knowledge Base Development Tool (KBDT)
65. Computerized Instructional System for Tasks, Objectives, Media, and Sybilli-Clipperized (CISTOMS-C)
66. All-Digital(tm) Integrated Video Analysis (ADIVA)(tm) System
67. The Observer

Army Research Laboratory

Human Figure Performance Modeling

Human Research & Engineering Directorate



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Human Figure Performance Modeling

Human Research & Engineering Directorate

Objective: An interactive, graphical man-model to interface with CAD/CAE processes for computer-based human factors assessment of advanced concepts early in the materiel design process.

The model must be:

- statistically representative of the full range of military and civilian user population
- resource efficient to use
- verifiable and valid

Approach: Develop techniques or modules that may be used by human figure modelers to achieve the objective through contracts and cooperative agreements with universities and commercial developers. Ensure they are valid when created.

- Government, industry, and academic coordination enhanced through SAE G-13 Committee

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Human Figure Performance Modeling

Human Research & Engineering Directorate

Jack Application (military only):

FMC - Bradley vision blocks

UDLP - Breecher (Grizzly) vehicle

UDLP - CAV emergency egress

ARL, HRED - A2C2S

ARL, HRED - BioStandoff detector unit

ARL, HRED - MAT for Navy & ARPA

AVRDEC & ARL, HRED - Air Warrior,
Longbow Apache, Comanche

Marine Corps (GD & UD, w/ARL, HRED guidance) - AAAV

Lockheed - F-16 component access

Lockheed - F-22 removal of power supply

Hughes - AMRAAM depot layout

ARL, HRED - ASV source selection support

ARL, HRED - AGS layout and egress problems

ARL, HRED - C2V layout

Human Figure Performance Modeling

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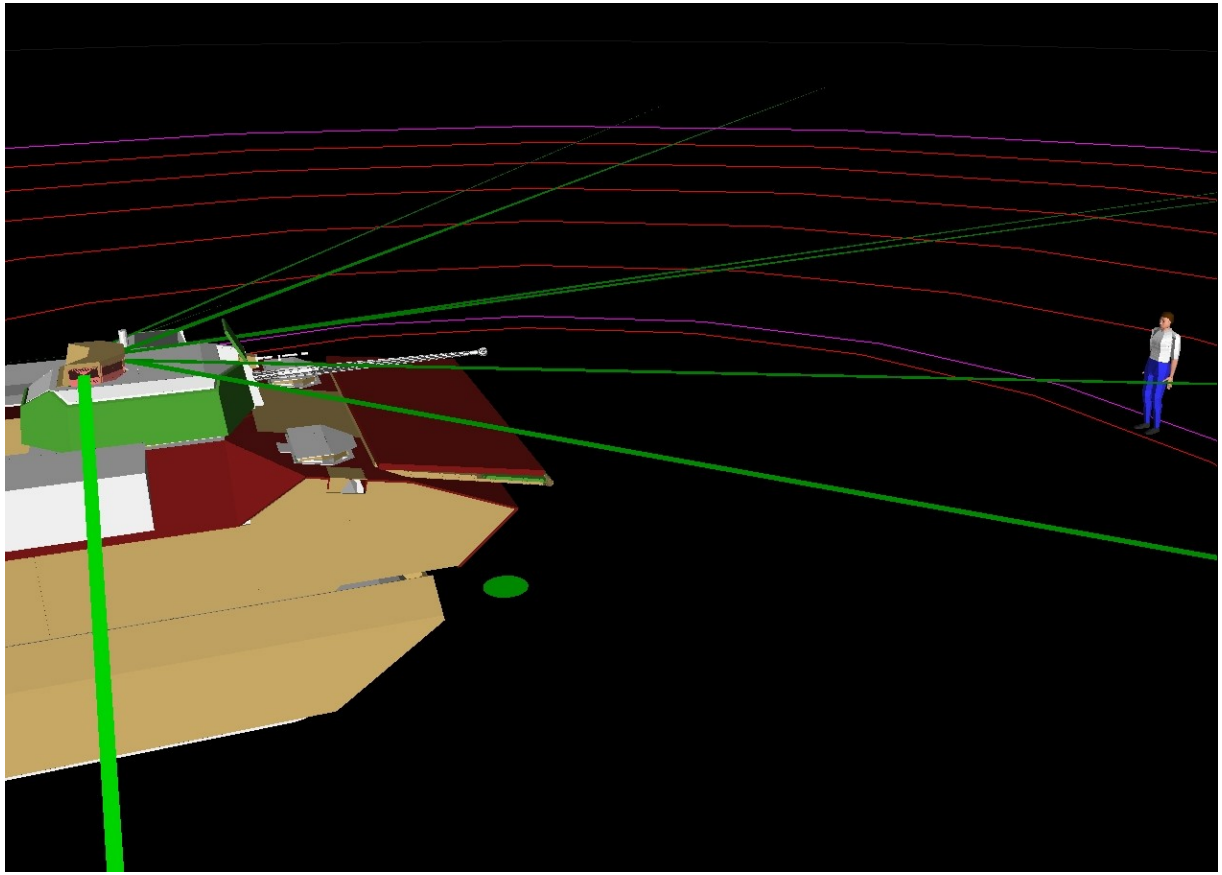
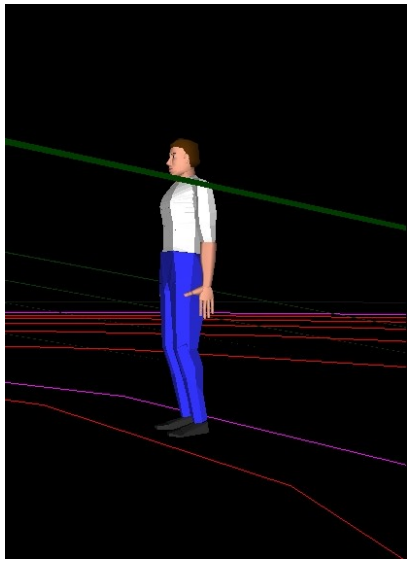
Human Research & Engineering Directorate





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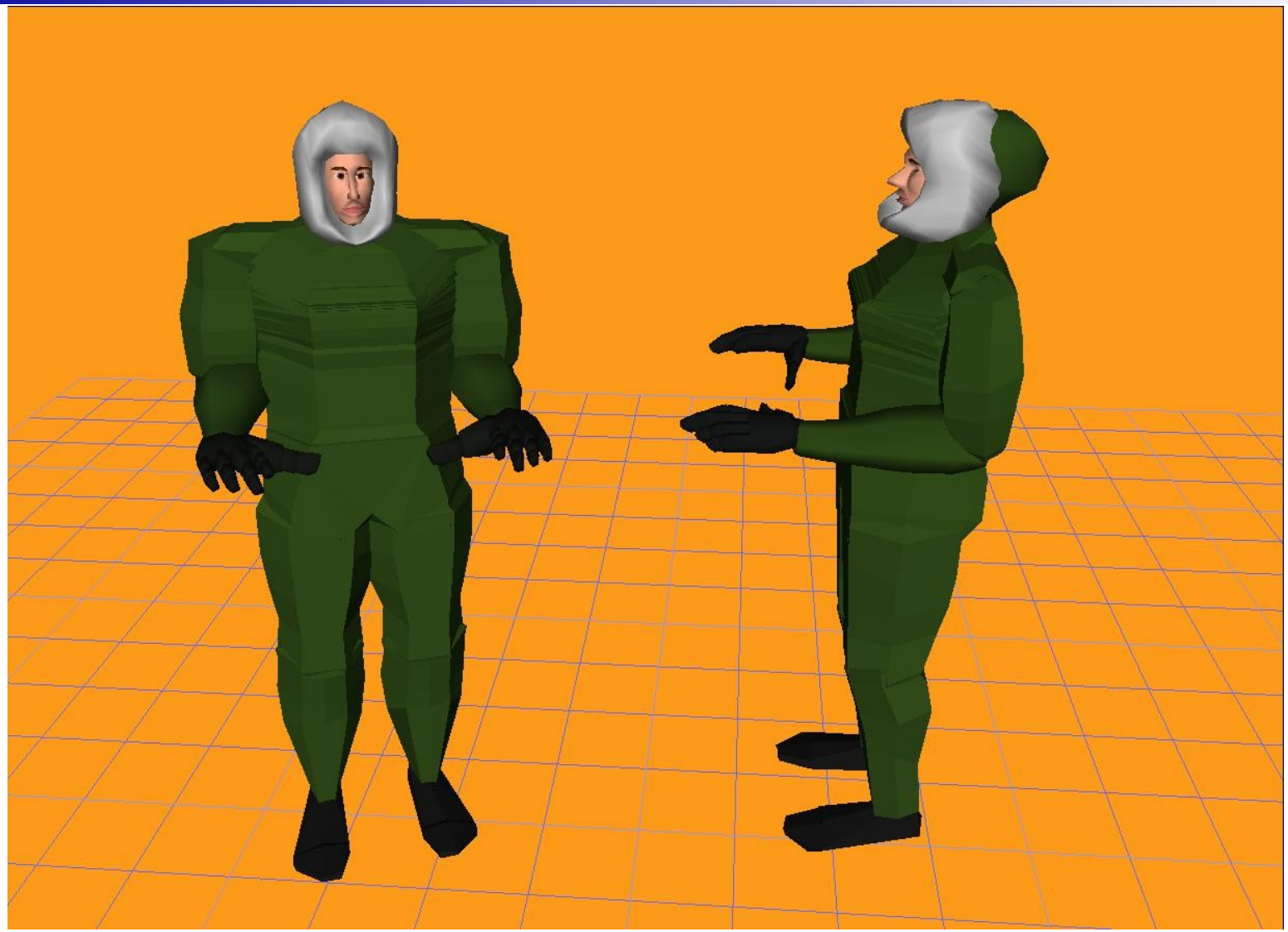

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Human Figure Performance Modeling

Human Research & Engineering Directorate

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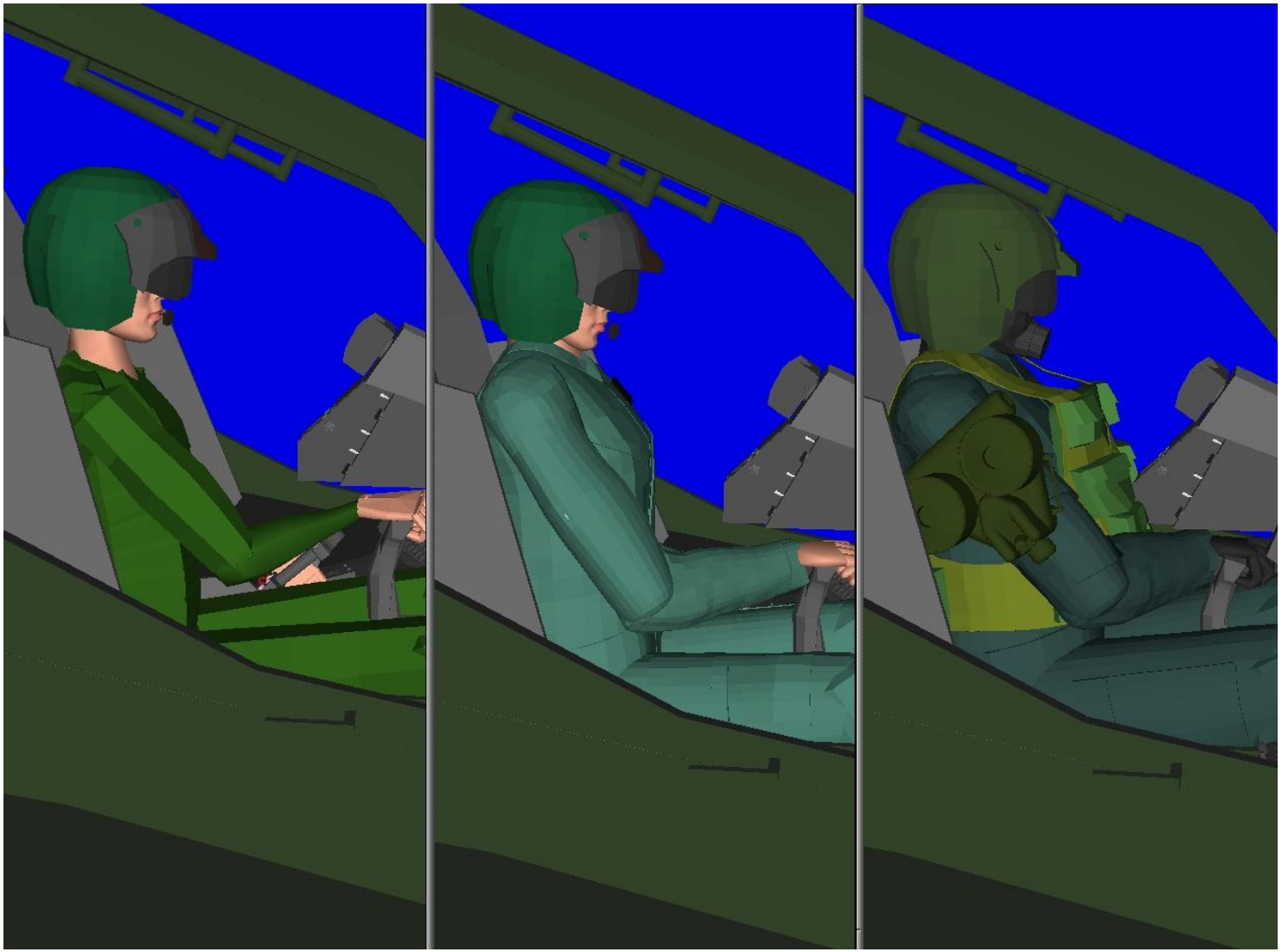
Human Figure Performance Modeling

Human Research & Engineering Directorate



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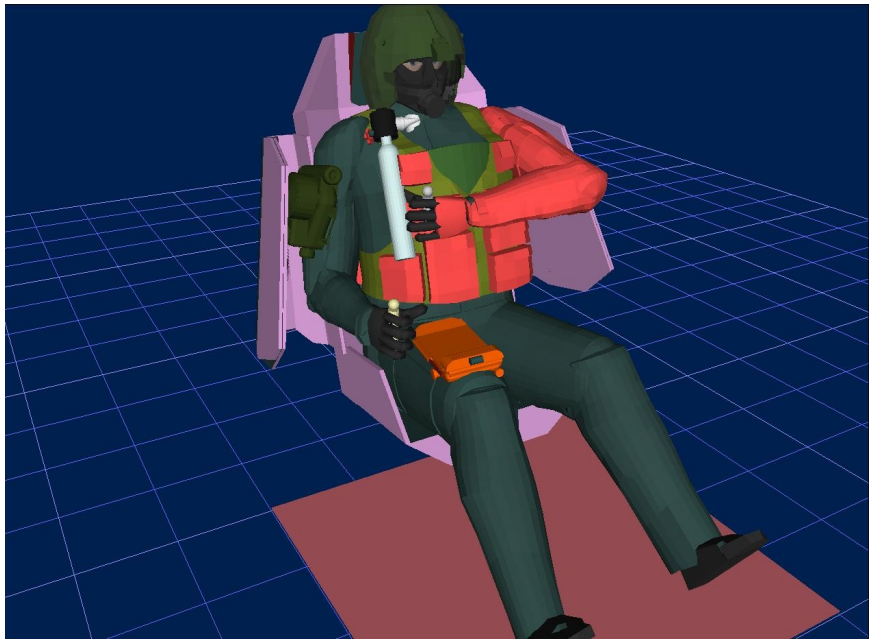
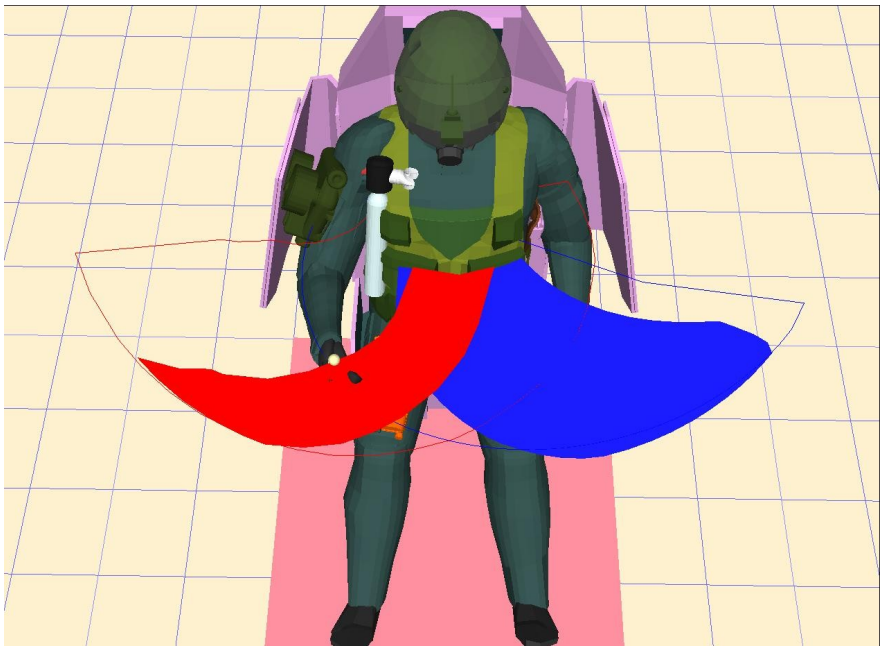
Human Figure Performance Modeling

Human Research & Engineering Directorate





Predicting range of motion for concept clothing and equi
ensembles

- full range of body sizes
- integrated into crew stations

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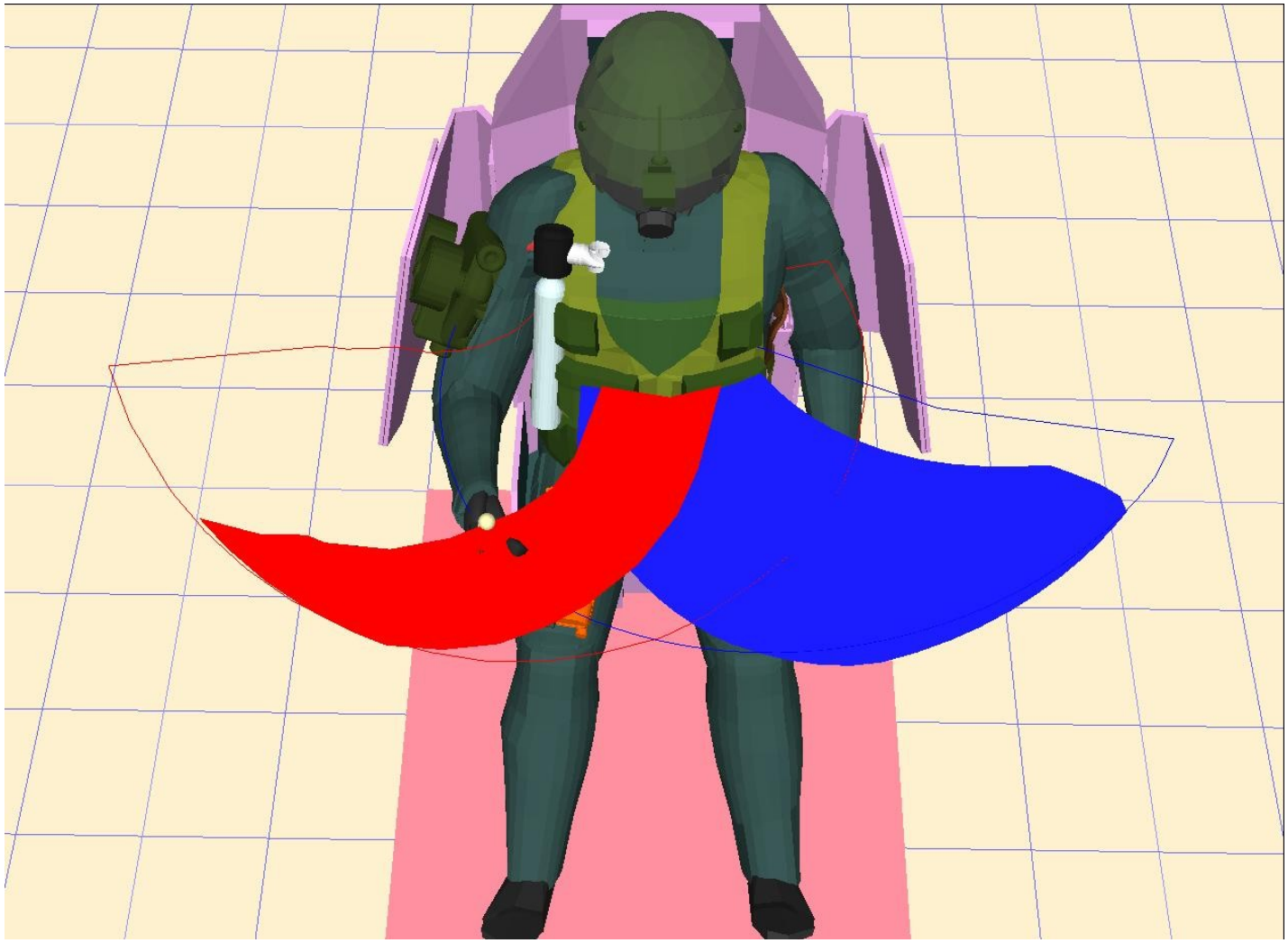
Human Figure Performance Modeling

Human Research & Engineering Directorate



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Human Figure Performance Modeling

Human Research & Engineering Directorate

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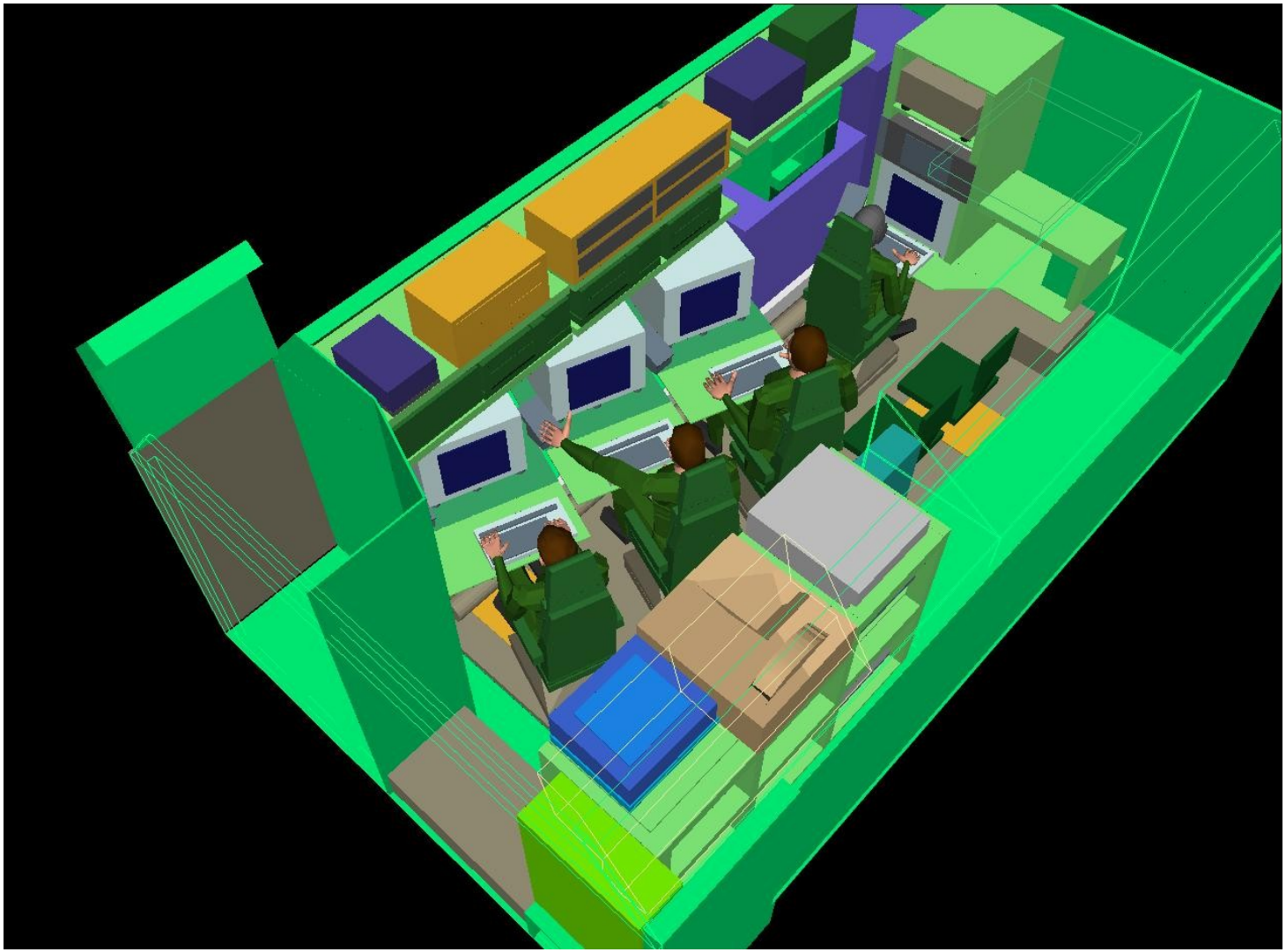

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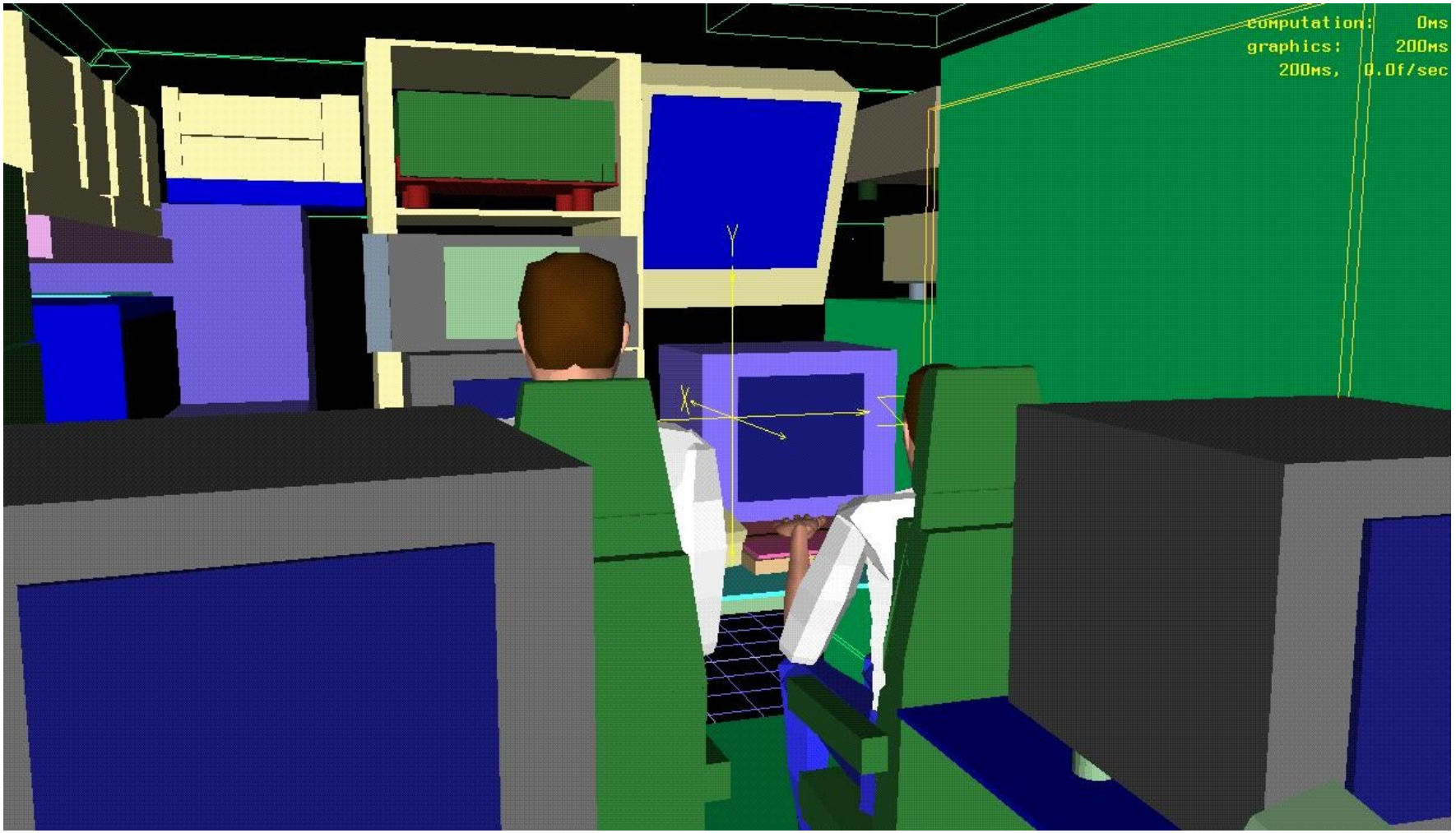

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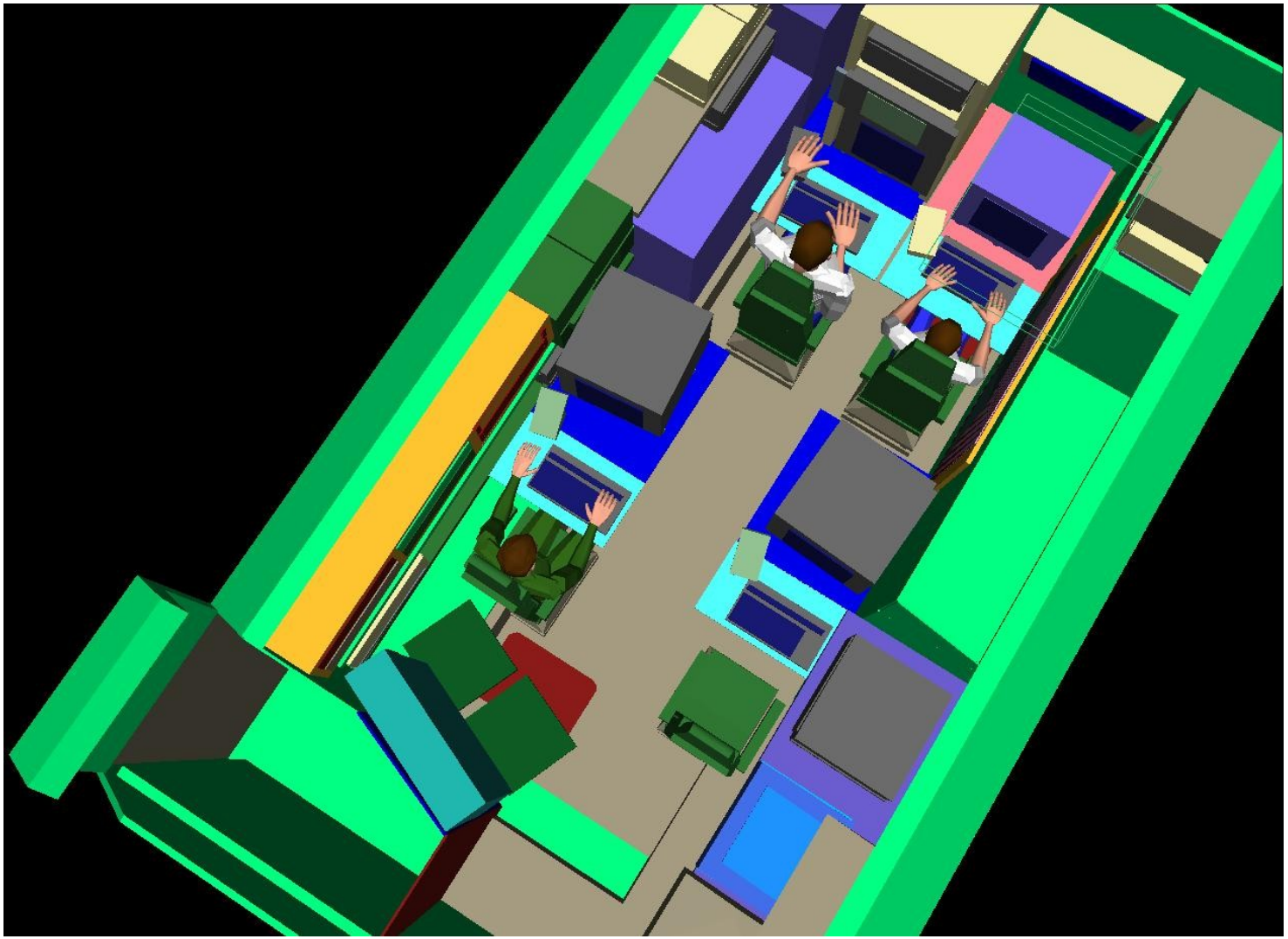

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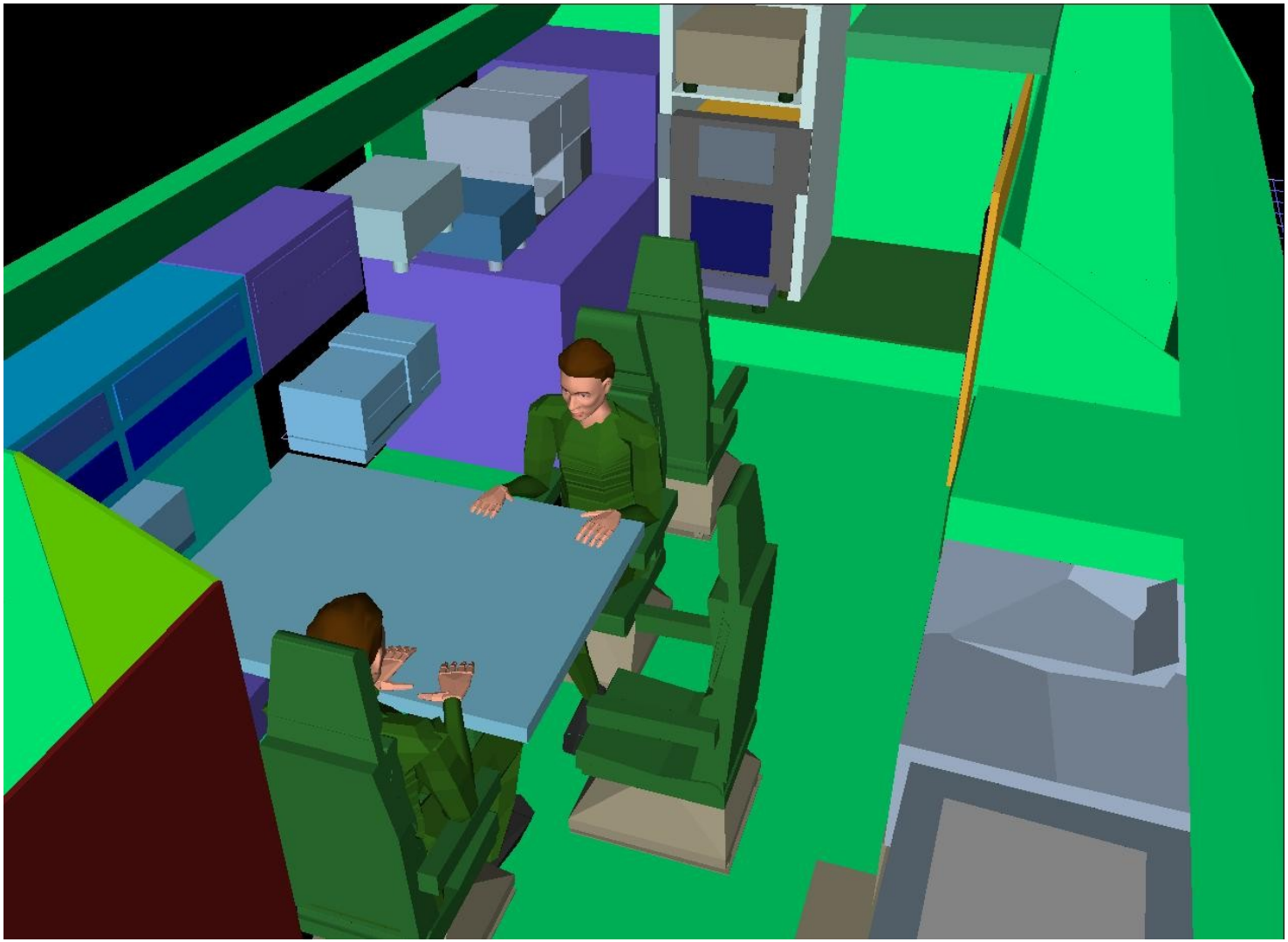
Human Research & Engineering Directorate



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Human Figure Performance Modeling

Human Research & Engineering Directorate

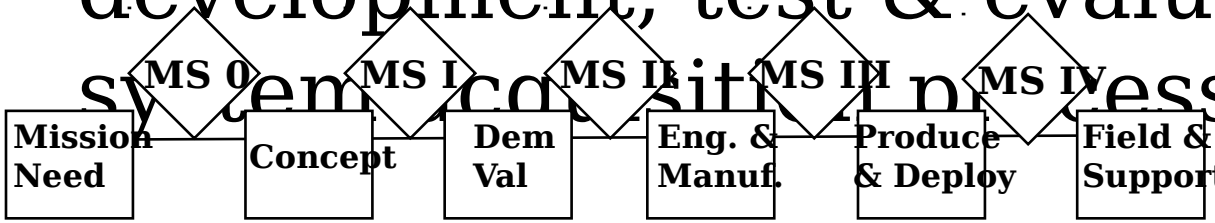
IMPRINT
(Improved Performance Research Integration Tool)

Successor to HARDMAN III
(Hardware vs. Manpower)

Approved for public release
Distribution unlimited

HARDMAN III & IMPRINT

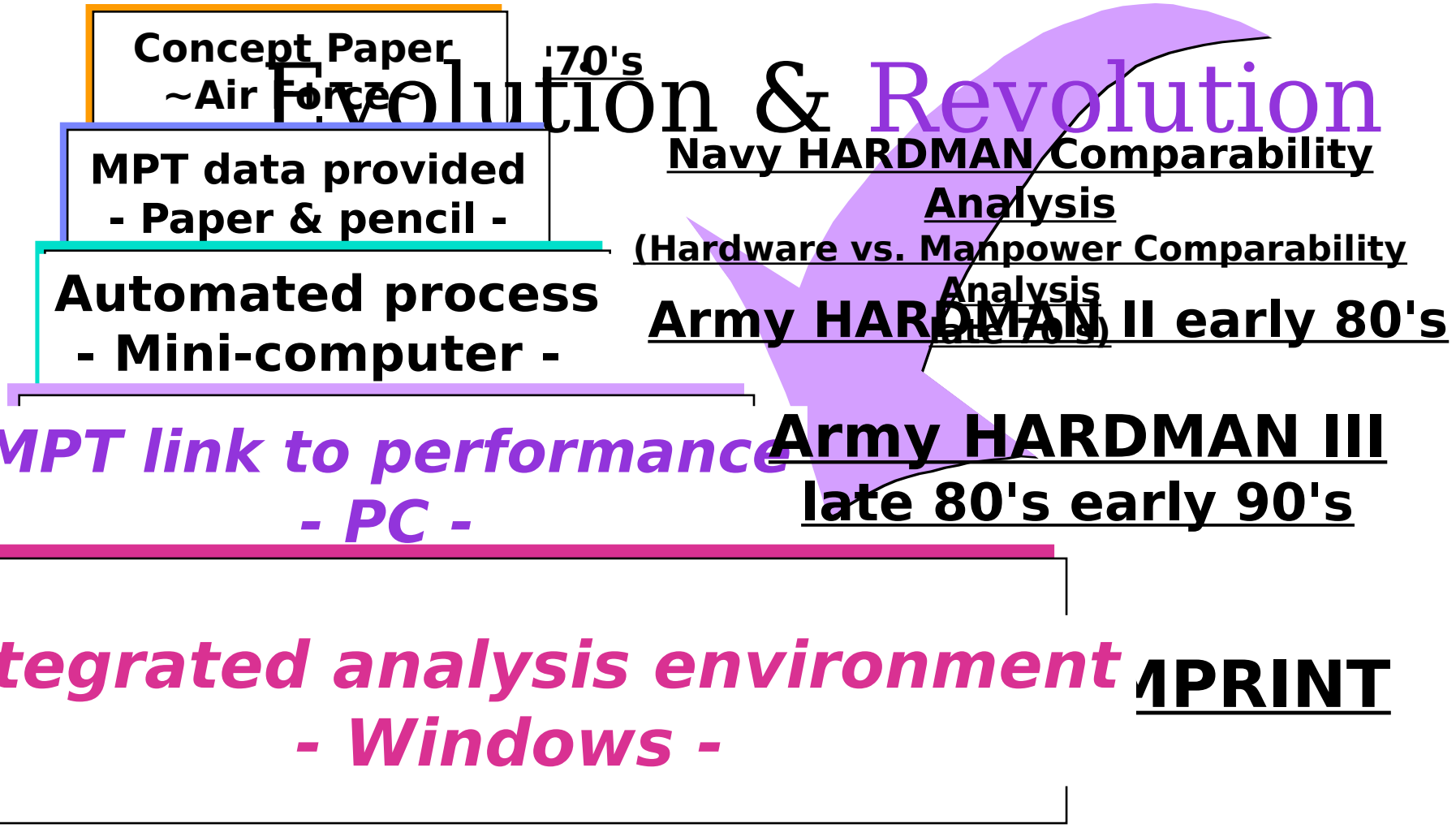
- PC-based soldier-system analysis tools for the Army's research, development, test & evaluation and system acquisition process



Goal:
Increase system effectiveness & reduce operations & support costs thru consideration of soldier in system

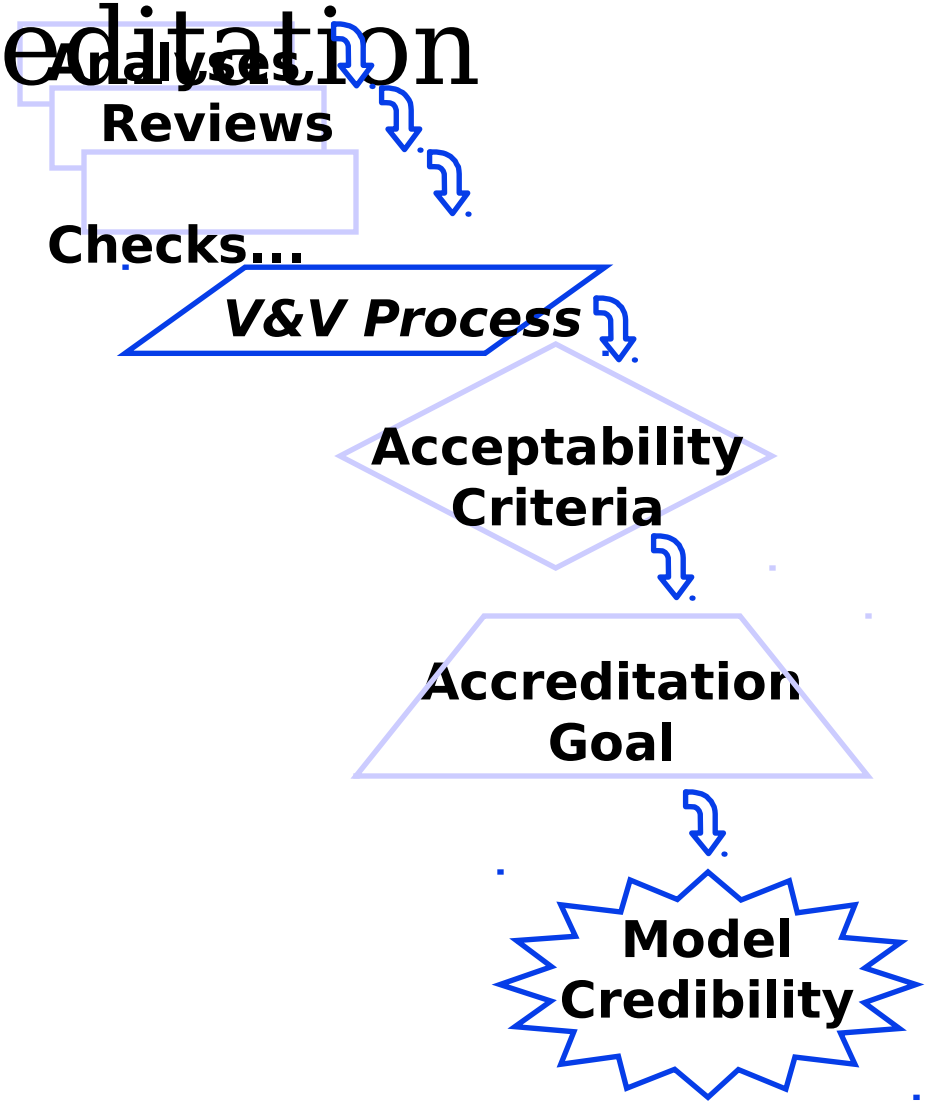
The time to do that is early!

History of Development:



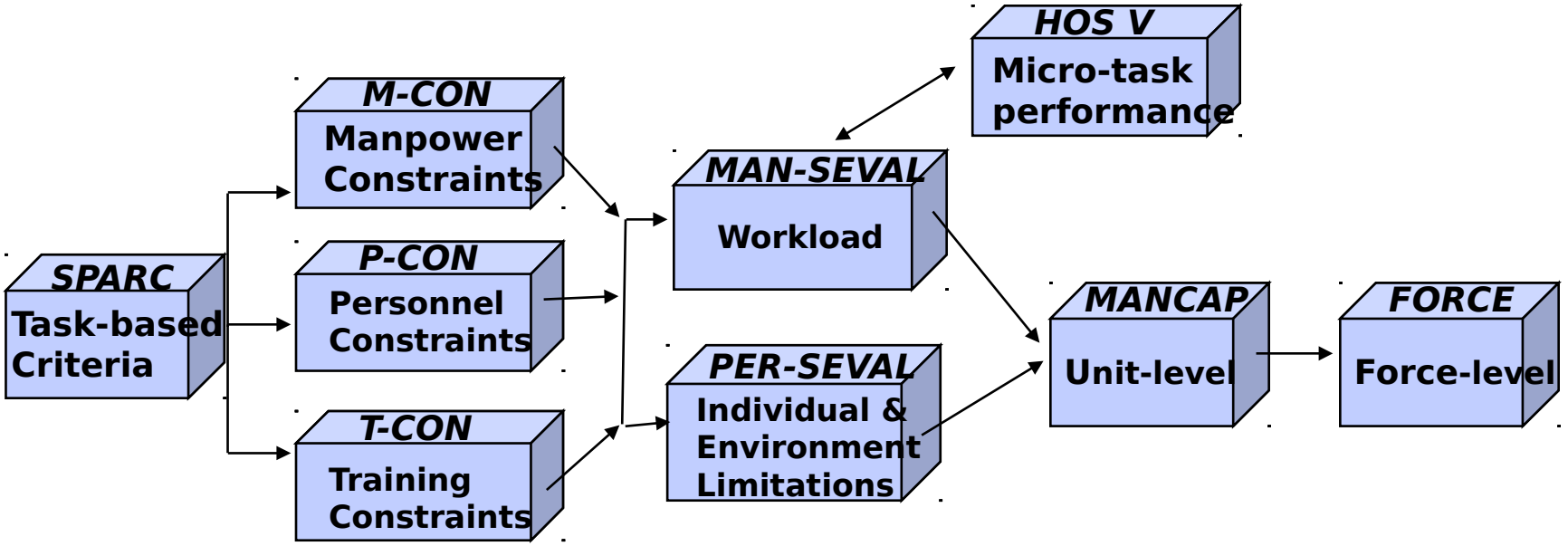
Verification, Validation & Accreditation

- Per AR 5-11, Army Model & Simulation Management Program
- Accreditation Board
  - ADCSPER, Chair
  - Members
    HQDA MANPRINT, SARDA, AMSMO, TRADOC, TRAC, PMO-UAV, AMSAA
- Phase I completed 2QF 95
- Phase II ongoing



HARDMAN III Modules

Hardware vs. Manpower



Definitions

SPARC: System Performance & RAM (Reliability, Availability, & Maintainability) Criteria Estimation

M-CON: Manpower Constraints Estimation

P-CON: Personnel Constraints Estimation

T-CON: Training Constraints Estimation

MAN-SEVAL: Manpower-based System Evaluation

PER-SEVAL: Personnel-based System Evaluation

MANCAP: Manpower Capabilities

FORCE: Force-level

HOS V: Human Operator Simulator V

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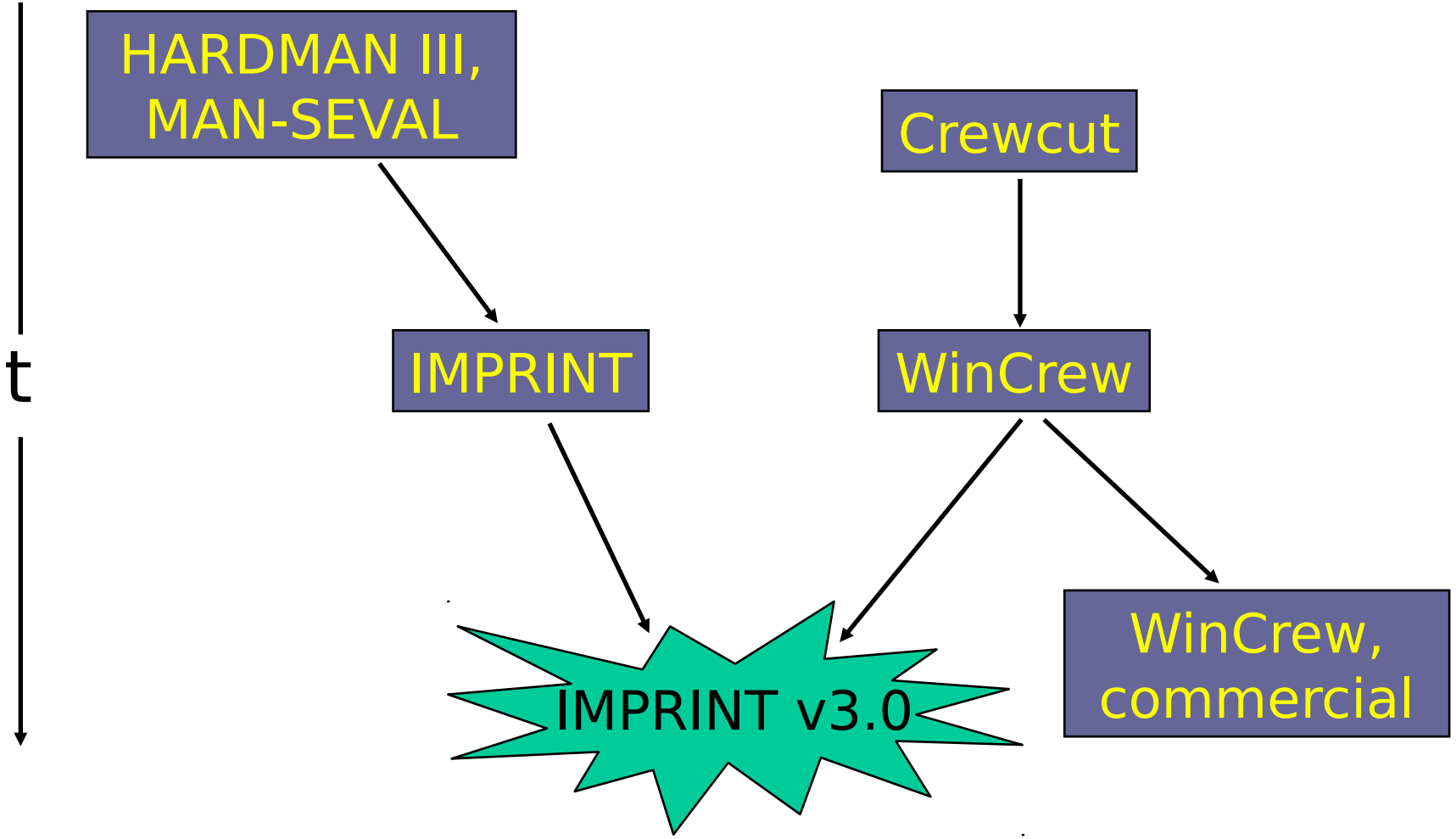
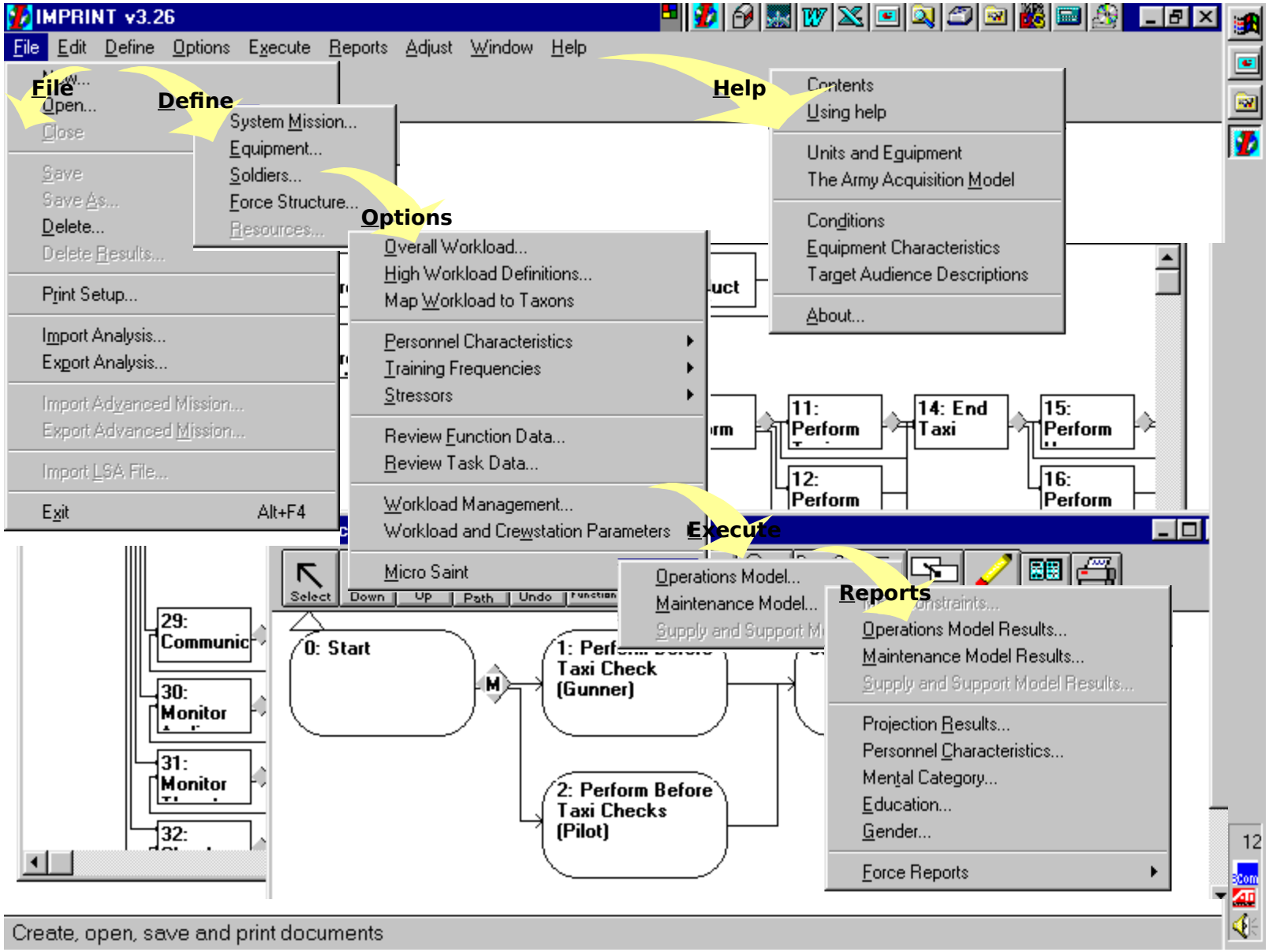
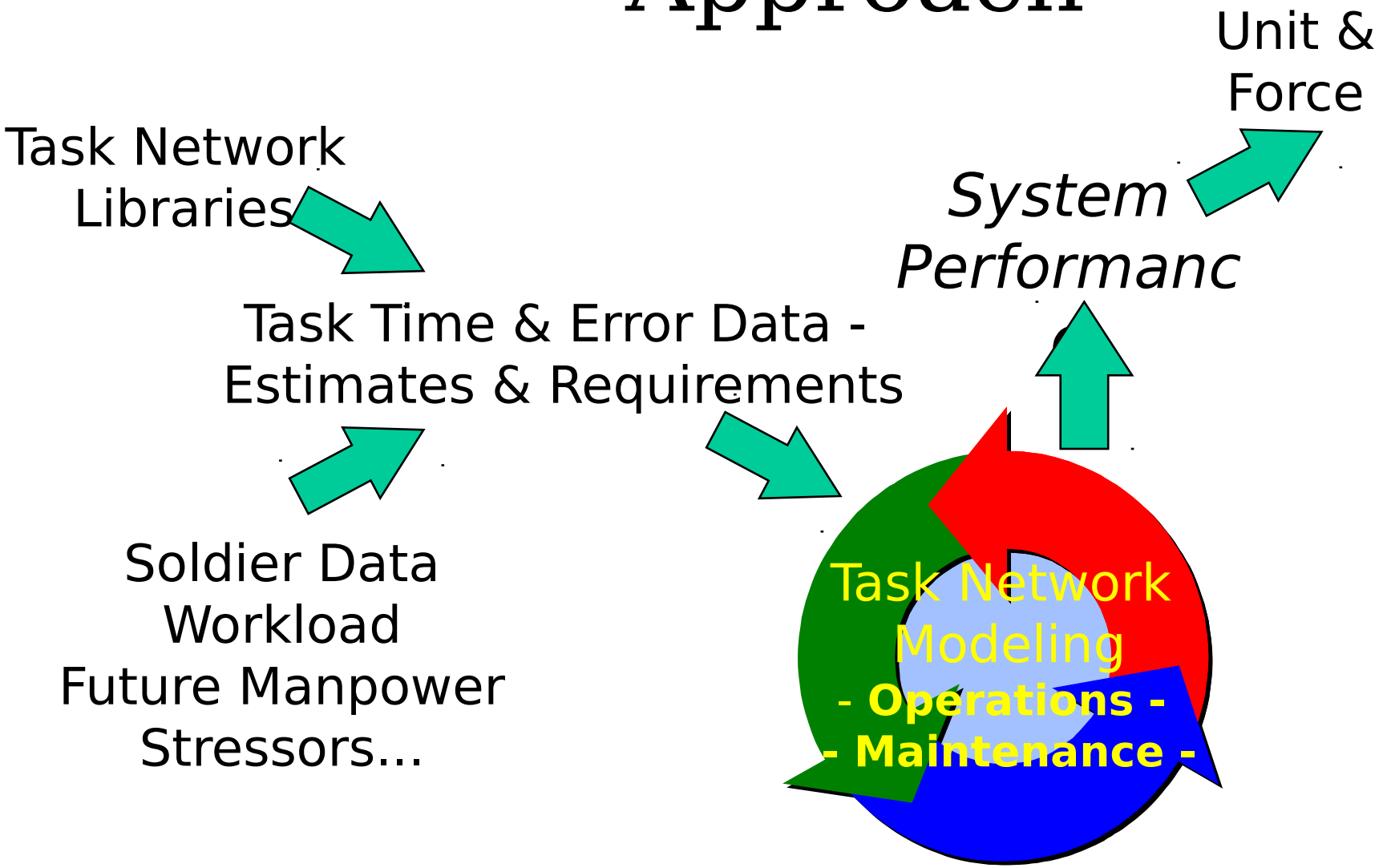
ARL HIRED Workload Modeling Tools



IMPRINT Interface



IMPRINT Technical Approach



IMPRINT Libraries & New

Mission Area	System Type	System
Air Defense	Air Defense Mobile Gun	M163 VULC
Air Defense	HIMAD	Patriot FP
Air Defense	Man-port Air Defense Sys	STINGER
Aviation	Attack Helicopter	AH-64A
Aviation	Cargo Helicopter	CH-47D
Aviation	Scout Helicopter	OH-58D
Aviation	Utility Helicopter	UH-60A
Close Combat Heavy	Cavalry Fighting Vehicle	M3 BRA
Close Combat Heavy	Tank	M1 ABF
Close Combat Light	Anti-tank Vehicle	M901 ITV
Close Combat Light	Automatic Weapon	M249 SAW
Close Combat Light	Grenade Launcher	M203
Close Combat Light	Infantry Fighting Vehicle	M2 BRA
Close Combat Light	Man-port. Anti-tank Wp	DRAGO
Close Combat Light	Man-port Indirect Fire Wp	M252 8
Close Combat Light	Rifle	M16A1
Combat Service Support	Heavy Truck	M977 HEMTT
Combat Service Support	Light Truck	M998 HMMWV
Fire Support	Med Range Missile Artill'y	LANCE
Fire Support	Rocket Field Artill'y System	MLRS
Fire Support	Self-propelled Howitzer	M109A2 HOW
Fire Support	Towed Howitzer	M102 HOW

OK

?

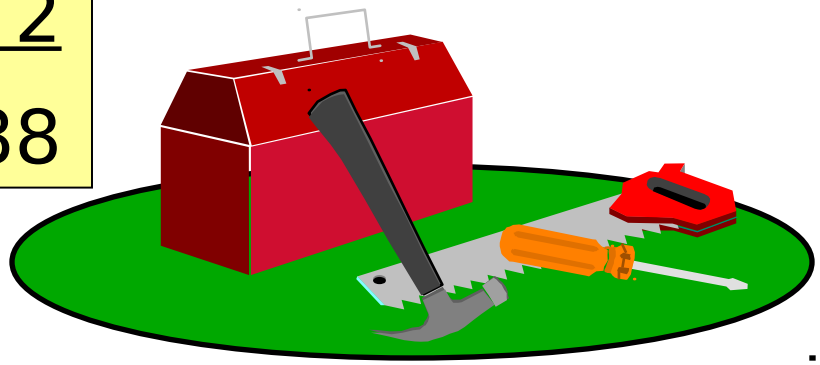
Plus new user-developed models for IMPRINT:

UAV
AAAV
Fox
Comanche
Longbow
Infantry
...

Embedded data include: task network, task times, workload, repair & failure times, soldier skill etc.

User Base - IMPRINT

Army	43
Navy	4
Marine Corps	2
Air Force	3
Coast Guard	1
Other Government	3
Contractors	31
University	2
Total this FY	88



Some Current Applications

- Army
- USMC & Army
- AF & Army
- Navy & Army

Crusader
Air Warrior
Maintenance MOS Consolidation
Fox NBC Recon Vehicle
Land Warrior
Advanced Amphibious Assault Vehicle (AAAV)
LW 155 Howitzer
NMD
Special Forces Joint Base Station

Workload & CONOPS

Degraded performance

New support concept

Impact of new design

Equipment feasibility

Maintainer requirements

Crew workload

Manning

Crew size & skill

SOME WORKLOAD MODELING APPLICATIONS

WinCrew Analyses:

- FAA Trans Oceanic Air Traffic Controller
- Advanced Amphibious Assault Vehicle
- Crewman's Associate ATD and Future Scout Vehicle
- Reduced Manning Aboard Ship (var. US Navy, Singapore MOD)
- Safety of Aircraft Squadrons under Reduced Manning
- Advanced Aircraft Display Concepts -- Adjunct to Experimentation
- Advanced Control Systems for Naval Surface

Crusader - Advanced Field Artillery System

- Build on early AFAS analyses

Findings for early MANPRINT Assessment:
> 2-man crew 6% more time, 80% more
than 3-man crew; auto upload required
> 40% more errors after 48 hrs

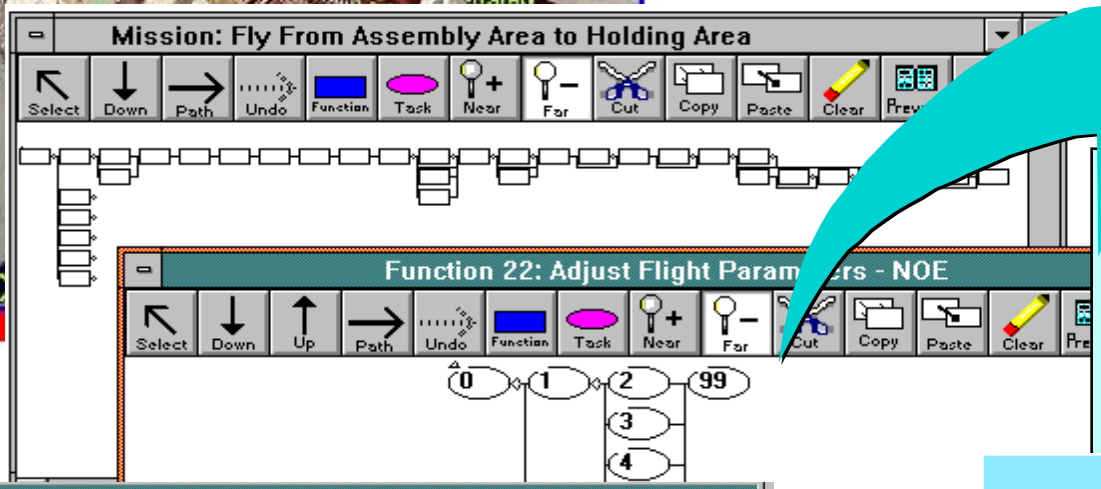
- As design matures, issues of
  - crew size
  - crew-equipment match
  - extended operations

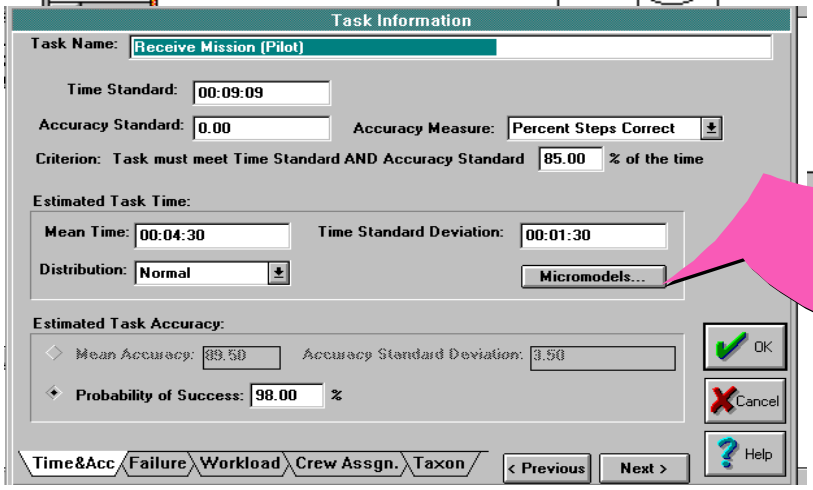
- Comparing Army & contractor analyses

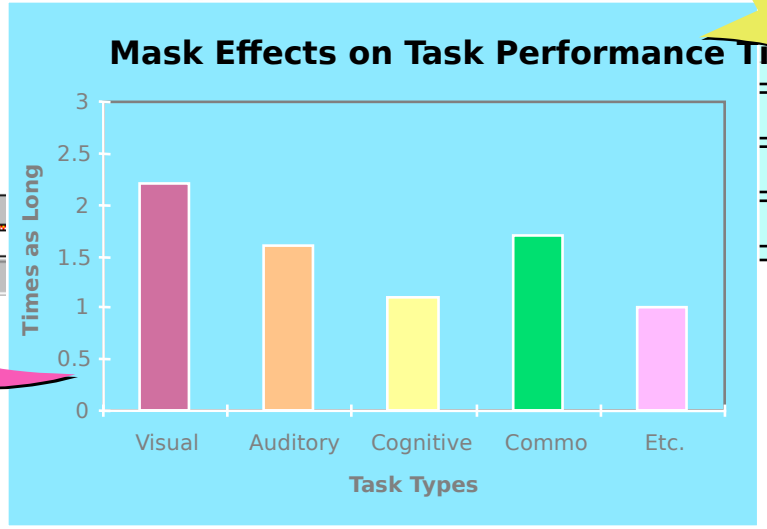
IMPRINT Modeling & Degraded Performance Factors for Air Warrior

System Performance Effects

Questionnaire



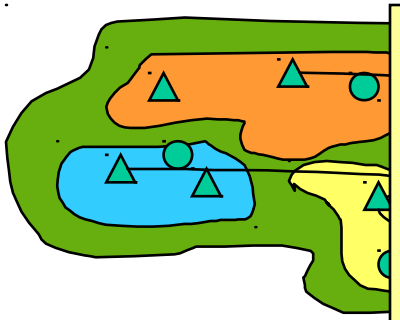




Model Input

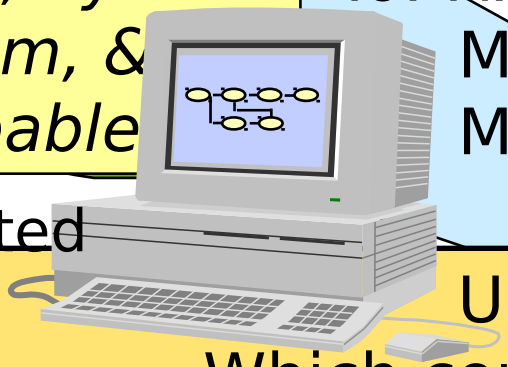
Modeling MOS Consolidation for Unit Design

From: Fixed maintenance levels
Rear maintenance...



IMPRINT Models Baseline , System Subsystem, & Multi-capable

To: Fix forward
Multi-capable mechani
Maintenance enablers

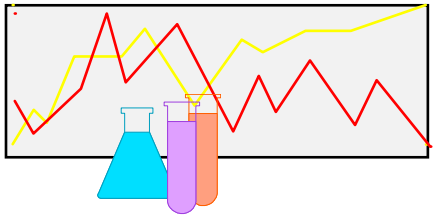


Designed & evaluated
early via task data;
org structures;
available manning;
skills & abilities;
system-mission
priorities

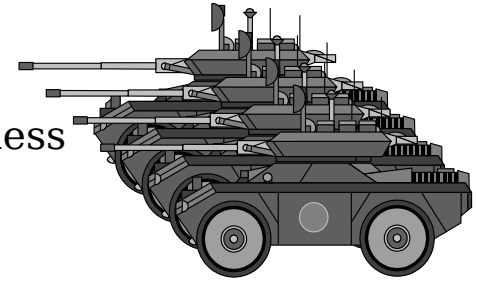
USAOC&S Question:
Which consolidation concept
gives greatest OA with lowest cost?

Army of Excellence → Force XXI → Army After Next

Technology Challenges



- Develop <u>sound</u> underlying methods & data to predict soldier requirements <u>early</u> in system development



➡Full range of performance stressors

- Moving from solider tasks to full unit & force effectiveness
- Enhanced cognitive task representation
- Links to force-on-force models & advanced simulations
- Coordination with AF on “purpling” IMPRINT and extending cognitive modeling capability

Synergies with Other R&D - IMPRINT

Research, Development, Trai
& Application

IMPRINT

Manpower, Personnel & Training Decision Support System
Armstrong Lab-USAF

Integrated Performance Modeling Environment
UK Defence Evaluation Research Agency

Integrated Unit Simulation System
Natick Army RDEC

Project A & Career Force
Army Research Institute

Stress & Performance Research
ARL-HRED

Workload Theory & Modeling
NAWC

Crew Casualty Assessment & Modeling
ARL-SLAD